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Injury and Collision Losses By Engine Option Selected 1983 Models

Highway Loss Data Institute

Highway Loss Data Institute
Insurance Special Report

Injury and Collision Losses
By Engine Option
Selected 1983 Models

HLDI A-23

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CONTENTS

1 **Summary**

2 **Introduction**

2 **Results and Discussion**

2 Personal Injury Protection Coverage Results

2 Collision Coverage Results

7 **Appendix A** Summary of Manufacturer's Engine Specifications for Selected 1983 Vehicles

7 **Appendix B** Standardization

8 **Appendix C** Definitions

9 **HLDI Publications**

3 **Table 1** Personal Injury Protection Coverage, Claim Frequencies By Engine Type

4 **Table 2** Collision Coverage, Average Loss Payments Per Insured Vehicle Year By Engine Type

5 **Table 3** Collision Coverage, Average Loss Payments By Engine Type

6 **Table 4** Collision Coverage, Claim Frequencies By Engine Type

SUMMARY

This report compares the collision and injury coverage loss results of eight 1983 model year vehicle series with standard equipment engines to the results for the same series with optional, more powerful engines. The vehicle series selected for this report are all mid-size or small passenger cars; at least one-third of the cars within each vehicle series have high performance engines. These cars are all two-door models and most are sports or specialty vehicles.

Principal Findings

- There was no consistent relationship between engine size and frequency of injury or collision claims. However, average loss payments per collision claim were substantially higher for cars equipped with more powerful engines than for those equipped with standard engines.

Personal Injury Protection Coverages

- Overall, the frequency of insurance *injury* claims did not correlate with engine size. Injury claim frequencies were higher for two of the series equipped with more powerful engines and they were lower for four such series compared to their counterparts equipped with standard engines. There was insufficient exposure to compare injury results for the other two vehicle series.

- The frequency of injury claims in which the medical payments exceeded $250 was lower for two of the series equipped with the more powerful engines, higher for one series, and showed no difference for one series compared to their versions equipped with standard engines. There was insufficient exposure to compute injury results for losses above $250 for the other four vehicle series.

Collision Coverages

- For *collision* coverages, six of the eight car series with more powerful engines had substantially higher average loss payments per insured vehicle year than those with standard engines. These increases ranged from 20 to 82 percent.

- For five of the eight car series, the cars with more powerful engines had substantially higher average loss payments per claim under collision coverages than their counterparts with standard engines.

- For both average loss payment per claim and average loss payment per insured vehicle year, the largest increases for the cars with the more powerful engines were for the five smallest vehicles.

- For six of the eight vehicle series, the collision coverage claim frequencies for cars with high performance engines were not substantially different from those with standard engines. The two exceptions were the V-8 engine equipped Mercury Capri, which had a claim frequency 37 percent higher than the four-cylinder engine version, and the V-8 engine equipped Ford Mustang, which had a 33 percent higher claim frequency than the four-cylinder engine version.

INTRODUCTION

The Highway Loss Data Institute (HLDI) is a nonprofit, public service organization that gathers, processes, and publishes insurance data concerning the human and economic losses associated with motor vehicles — especially the ways such losses vary among different kinds of vehicles.

In 1981, HLDI published a report on the relationships between insurance losses and engine specifications that was based on the injury and collision coverage results of 1977 through 1979 compact cars.[1] The report concluded that there were pronounced relationships between the collision coverage loss experience and engine size for specialty models. The cars with the most powerful engines had the worst loss experience. No consistent relationship was found for injury loss results and engine size. No consistent relationships were found between injury or collision results and engine size for regular two-door and four-door models.

This report compares collision and injury coverage loss results of high performance and less powerful standard engine versions of eight 1983 model cars. The selected 1983 cars used in this study were: the Chevrolet Camaro and Monte Carlo; Ford Mustang, Mustang Convertible, and Thunderbird; Pontiac Firebird and Grand Prix; and Mercury Capri. These 1983 cars were chosen because they are all midsize or small two-door vehicles, and because at least one-third of the cars within each vehicle series have factory installed, more powerful engines. Appendix A lists the vehicle series and their manufacturers' engine specifications.

The individual cars of each series were separated into two groups based on Vehicle Identification Numbers (VINs): those with standard equipment four- or six-cylinder (V-6) engines and those with optional high performance four-cylinder turbocharged or eight-cylinder (V-8) engines. The results in this report are based on the first two years of available personal injury protection and collision coverage data for the selected 1983 vehicle series. The data were supplied by eleven insurers: Aetna, Allstate, GEICO, Kemper, Liberty Mutual, Nationwide, Prudential, Safeco, State Farm, Travelers, and USAA.

RESULTS AND DISCUSSION

Personal Injury Protection Coverage Results. Table 1 (page 3) presents exposure (in insured vehicle years), overall injury claim frequency, and frequency of claims in which medical payments exceeded $250 for high performance engines and standard engines for each vehicle series.[2] The Mercury Capri and Ford Mustang Convertible did not have sufficient exposure to report overall injury claim frequency results. In four of the six comparisons for which there was sufficient exposure, the frequency of overall injury claims was *lower* for the cars with the more powerful engines. In the other two comparisons, the high performance models of both the Ford Mustang and Ford Thunderbird had *higher* overall injury claim frequencies.

For injury claims in which the medical payments exceeded $250, the frequency of injury was lower for the high performance models of both the Chevrolet Camaro and Monte Carlo. No difference was found between the claim frequencies for the high performance and standard V-6 equipped Ford Thunderbirds. The high performance Pontiac Grand Prix, however, had a higher injury claim frequency than its standard engine counterpart.

Collision Coverage Results. For each of the eight vehicle series, Table 2 (page 4) shows average loss payments per insured vehicle year under collision coverages and the percentage increase in this result for cars with high performance engines versus those with standard engines.[3] For the Pontiac Grand Prix and Chevrolet Monte Carlo, the average loss payments per insured vehicle year were about the same for the two versions. However, the comparisons for the six remaining series show that the average loss payments per insured vehicle year increased by between 20 percent (Ford Thunderbird) and 82 percent (Mercury Capri) for the cars with more powerful engines.

The cars with V-8 engines generally had higher average loss payments per claim (Table 3, page 5). For example, the Ford Mustang Convertible with the V-8 engine had a 37 percent higher average loss payment per claim than its four-cylinder counterpart. Similarly, the V-8 version of the Mercury Capri had a 34 percent higher average loss payment per claim than the four-cylinder version. For both average loss payment per claim and average loss payment per insured vehicle year, the largest percentage changes were associated with the five smallest vehicles. Because the injury claim frequencies were not consistently higher for models with more powerful engines, it is probable that their poorer collision coverage experience reflects the cost of other features associated with high performance models, such as special trim and paint options, rather than more severe crashes.

Table 4 (page 6) shows the collision coverage claim frequencies for each of the eight models. Most of the comparisons show very little difference in claim frequencies between models with the two types of engines. The exceptions were the two vehicle series with the largest difference in horsepower between the high performance and standard engine version; the claim frequency was 37 percent higher for the V-8 Mercury Capri and it was 33 percent higher for the V-8 Ford Mustang compared to the standard engine versions. Overall, the collision claim frequencies for the cars with the more powerful engines were not substantially different from the claim frequencies for standard engine versions.

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[1]See HLDI Research Report A-15.

[2]Injury results were standardized to eliminate effects due to operator age groups. See Appendix B for standardizing weights.

[3]Collision results were standardized to eliminate effects due to operator age groups and deductible amounts. See Appendix B for standardizing weights.

TABLE 1
Personal Injury Protection Coverage
Claim Frequencies By Engine Type
Selected 1983 Vehicles

Vehicle	Engine Version	Exposure	Overall Injury Claim Frequency*	Injury (>$250) Claim Frequency*
Mercury Capri	V-8	986		
	4 Cyl.	2853		
Ford Mustang	V-8	5683	29.7	
	4 Cyl.	12295	27.7	
Ford Mustang Convertible	V-8	1003		
	4 Cyl.	2842		
Chevrolet Camaro	V-8	17957	23.4	11.4
	V-6	15551	28.1	12.4
Pontiac Firebird	V-8	6085	20.1	
	V-6	8262	25.7	
Pontiac Grand Prix	V-8	8507	18.5	10.7
	V-6	13744	20.9	9.7
Chevrolet Monte Carlo	V-8	9411	19.9	10.1
	V-6	12484	22.6	11.7
Ford Thunderbird	V-8/4 Cyl. Turbo	7884	23.4	10.2
	V-6	14476	21.8	10.2

* Per 1,000 insured vehicle years of exposure
Blanks indicate insufficient exposure for calculating injury claim frequency result

TABLE 2
Collision Coverage
Average Loss Payments Per Insured Vehicle Year By Engine Type
Selected 1983 Vehicles

Vehicle	Engine Version	Exposure	Average Loss Payment Per Insured Vehicle Year	Percentage Change in Average Loss Payment Per Insured Vehicle Year*
Mercury Capri	V-8	2497	$301	+82%
	4 Cyl.	6413	165	
Ford Mustang	V-8	13871	307	+73
	4 Cyl.	28591	177	
Ford Mustang Convertible	V-8	2606	197	+44
	4 Cyl.	6943	137	
Chevrolet Camaro	V-8	41938	251	+26
	V-6	31407	200	
Pontiac Firebird	V-8	13862	256	+26
	V-6	15883	203	
Pontiac Grand Prix	V-8	19347	141	0
	V-6	26342	141	
Chevrolet Monte Carlo	V-8	22433	149	+3
	V-6	23313	145	
Ford Thunderbird	V-8/4 Cyl. Turbo	20484	200	+20
	V-6	31638	167	

* Percentage change in average loss payment per insured vehicle year for models with more powerful engines relative to their standard engine versions

TABLE 3
Collision Coverage
Average Loss Payments By Engine Type
Selected 1983 Vehicles

Vehicle	Engine Version	Exposure	Average Loss Payment Per Claim	Percentage Change in Average Loss Payment Per Claim*
Mercury Capri	V-8	2497	$2115	+34%
	4 Cyl.	6413	1584	
Ford Mustang	V-8	13871	2259	+30
	4 Cyl.	28591	1734	
Ford Mustang Convertible	V-8	2606	1989	+37
	4 Cyl.	6943	1447	
Chevrolet Camaro	V-8	41938	1865	+32
	V-6	31407	1416	
Pontiac Firebird	V-8	13862	1671	+20
	V-6	15883	1390	
Pontiac Grand Prix	V-8	19347	1395	−1
	V-6	26342	1416	
Chevrolet Monte Carlo	V-8	22433	1566	+4
	V-6	23313	1511	
Ford Thunderbird	V-8/4 Cyl. Turbo	20484	1658	+9
	V-6	31638	1527	

* Percentage change in average loss payment per claim for models with more powerful engines relative to their standard engine versions

TABLE 4
Collision Coverage
Claim Frequencies By Engine Type
Selected 1983 Vehicles

Vehicle	Engine Version	Exposure	Claim Frequency*	Percentage Change in Claim Frequency**
Mercury Capri	V-8	2497	14.2	+37 %
	4 Cyl.	6413	10.4	
Ford Mustang	V-8	13871	13.6	+33
	4 Cyl.	28591	10.2	
Ford Mustang Convertible	V-8	2606	9.9	+5
	4 Cyl.	6943	9.4	
Chevrolet Camaro	V-8	41938	13.5	−4
	V-6	31407	14.1	
Pontiac Firebird	V-8	13862	15.3	+5
	V-6	15883	14.6	
Pontiac Grand Prix	V-8	19347	10.1	+2
	V-6	26342	9.9	
Chevrolet Monte Carlo	V-8	22433	9.5	−1
	V-6	23313	9.6	
Ford Thunderbird	V-8/4 Cyl. Turbo	20484	12.1	+11
	V-6	31638	10.9	

* Per 100 insured vehicle years of exposure
** Percentage change in claim frequency for models with more powerful engines relative to their standard engine versions

APPENDIX A
Summary of Manufacturer's Engine Specifications For Selected 1983 Vehicles

Vehicle	Engine Type	Carburation	Displacement (Liters/Cubic Inch)	Net Horsepower at RPM
Mercury Capri	V-8	4 BBL[1]	5.0/302	175/4000
	4 Cyl.	1 BBL	2.3/140	90/4600
Ford Mustang	V-8	4 BBL	5.0/302	175/4000
	4 Cyl.	EFI[2]	2.3/140	90/4600
Ford Mustang Convertible	V-8	4 BBL	5.0/302	175/4000
	4 Cyl.	1 BBL	2.3/140	90/4600
Chevrolet Camaro	V-8	4 BBL	5.0/305	150/4000
	V-6	2 BBL	2.8/173	107/4800
Pontiac Firebird	V-8*	4 BBL	5.0/305	150/4000
	V-6	2 BBL	2.8/173	107/4800
Pontiac Grand Prix	V-8	4 BBL	5.0/305	150/4000
	V-6	2 BBL	3.8/231	110/3800
Chevrolet Monte Carlo	V-8	4 BBL	5.0/305	150/4000
	V-6	2 BBL	3.8/229	110/4000
Ford Thunderbird	V-8	4 BBL/CFI[3]	5.0/302	130/3200
	4 Cyl. Turbo	EFI	2.3/140	145/3800
	V-6	2 BBL	3.8/232	110/3800

* Includes the Pontiac Trans/AM
[1] BBL = Barrels
[2] EFI = Electronic Fuel Injection
[3] CFI = Central Fuel Injection

Source: Motor Vehicle Manufacturers Association, specifications from Ford Motor Company and General Motors Company

APPENDIX B Standardization

Insurance loss experience varies in relation to certain non-vehicle factors. With respect to Personal Injury Protection (PIP) coverages, one important factor that influences loss experience is operator age. Youthful operators generally have worse loss experience than older drivers. Thus, the proportions of youthful operators must be taken into consideration in comparing the loss experience of different vehicles.

To remove any biases that could result because of variations among different vehicles in an operator age group, the PIP coverage results for the vehicles in this study were weighted, or standardized, to produce a weighted average of actual results. The weights used in the standardization procedure are shown below.

Operator Age Group	Distribution
Youthful	.10
Nonyouthful	.90

With respect to collision coverages, both the frequency and average size of collision losses vary with the deductible

amount and the age group of the operators. Therefore, collision coverage results for the vehicles in this study were standardized using the weights shown below.

Deductible	Youthful Operator	Nonyouthful Operator
< $150	.05	.50
≥ $150	.05	.40

Standardizing these nonvehicle factors ensures that their mix is the same for each result. Therefore, to the extent that age distributions within each operator age group and amounts within each deductible group do not vary substantially for different vehicles, these effects will not bias comparisions among the various results.

The standarization procedure employed is widely used in health statistics.* The basic principle of the method is the introduction of a selected population with a standard distribution across operator age group, or across the combination of operator age group and deductible, as represented by the standardization weights in the tables.

APPENDIX C Definitions

Average Loss Payment per Claim — The total of all loss payments made for the claims for a group of vehicles, divided by the number of claims paid; expressed as dollars per claim.

Average Loss Payment per Insured Vehicle Year — For a group of vehicles, the product of Claim Frequency and Average Loss Payment per Claim, divided by 100; expressed as dollars per insured vehicle year. It should be noted that this definition differs from the commonly used insurance term, pure premium, but yields similar results.

Collision Claim Frequency — The number of claims for a group of vehicles, divided by the exposure for that group; expressed as claims per one hundred insured vehicle years.

Collision Coverages — As defined in insurance contracts, the coverage under which people insure their own vehicle against loss caused by collision.

Deductible Amount — That portion of the collision damage cost borne by the policyholder. For computing results, deductible amounts are split into two groups; less than $150 (mainly $50 and $100 deductibles) and greater than or equal to $150 (mainly $200 and $250 deductibles).

Exposure — The time interval an individual vehicle is insured. Exposure for a group of vehicles is expressed in units of insured vehicle years.

Personal Injury Protection (PIP) Claim Frequency — The number of claims for a group of vehicles, divided by the exposure for that group; expressed as claims per one thousand insured vehicle years.

Personal Injury Protection Coverage — First-party no-fault coverage in which an insurer pays, within the specified limits, the medical, hospital, and other expenses of the insured, others in his vehicle, and pedestrians struck by him.

Operator Age Group — The factor which distinguishes those vehicles whose rated driver is youthful from those vehicles whose rated driver is not youthful (see Youthful Operator).

Rated Driver — The driver who, for insurance purposes, is considered to represent the greatest loss potential for the insured vehicle.

Vehicle Size Class — There are four major body style groupings of passenger vehicles — regular two-door models, regular four-door models, station wagons and passenger vans, and sports and specialty models. Sports and specialty models include all two-seater cars, all convertibles, all midsize and large cars with two or fewer designated rear seating positions, and all luxury cars. All vehicles are divided into size classes based on wheelbase (rounded to nearest inch) defined as follows:

Small — Vehicles with wheelbases less than or equal to 99 inches.

Midsize — Vehicles with wheelbases greater than 99 inches and less than or equal to 109 inches.

Large — Vehicles with wheelbases greater than 109 inches.

Vehicle Identification Number (VIN) — A code, variously comprising both numbers and letters; normally, 8 to 17 characters in length, assigned to each vehicle by its manufacturer. The VIN uniquely identifies the vehicle within at least a ten-year span and, in recent model year vehicles, contains coding which identifies the make, series, model year, and other characteristics of each vehicle.

Vehicle Series — A name denoting a family of vehicles, within a make, with the same wheelbase and a degree of commonality in construction such as body, chassis, etc.

Youthful Operator — For the purposes of this report, all males (married or single) under 25 years of age and all unmarried females under 25 years of age.

*For example, see Armitage, P. *Statistical Methods in Medical Research*, Wiley, New York (1971).

HLDI Publications

Research reports published by the Highway Loss Data Institute are:

R72-1 *Automobile Insurance Losses, Collision Coverages; Variations by Make and Series, 1972 Models,* June 1973.

R73-1 *Automobile Insurance Losses, Collision Coverages; Initial Results for 1973 Models Compared with 1972 Models,* September 1973.

R73-2 *Automobile Insurance Losses, Collision Coverages; Variations by Make and Series, 1973 Models,* March 1974.

R73-3 *Automobile Insurance Losses, Collision Coverages; Variations by Make and Series, 1973 Models During Their First Two years,* December 1974.

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R74-1 *Automobile Insurance Losses, Collision Coverages; Initial Results for 1974 Models,* May 1974.

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R78-2 *Automobile Insurance Losses, Collision Coverages; Variations by Make and Series, 1978 Models During Their First Year, 1977 Models During Their First Two Years, 1976 Models During Their First Three Years,* January 1979.

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R81-2 *Insurance Losses, Collision Coverages; Passenger Cars, Vans, Pickups, and Utility Vehicles; 1981 Models During Their First Year, 1980 Models During Their First Two Years, 1979 Models During Their First Three Years,* December 1981.

R82-1 *Automobile Insurance Losses, Collision Coverages; Initial Results for 1982 Models,* July 1982.

R82-2 *Insurance Losses, Collision Coverages; Passenger Cars, Vans, Pickups, and Utility Vehicles; 1982 Models During Their First Year, 1981 Models During Their First Two Years; 1980 Models During Their First Three Years,* December 1982.

R83-1 *Automobile Insurance Losses, Collision Coverages; Initial Results for 1983 Models,* June 1983.

R83-2 *Insurance Losses, Collision Coverages; Passenger Cars, Vans, Pickups, and Utility Vehicles; 1983 Models During Their First Year, 1982 Models During Their First Two Years, 1981 Models During Their First Three Years,* January 1984.

R84-1 *Automobile Insurance Losses, Collision Coverages; Initial Results for 1984 Models,* June 1984.

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V80-1 *Automobile Insurance Losses, Non-Commercial Collision Coverages; Variations by Make and Series, Vans, Pickups, and Utility Vehicles; 1980 Models During Their First Year, 1979 Models During Their First Two Years, 1978 Models During Their First Three Years,* December 1980.

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A-7 *Automobile Insurance Losses, Collision Coverages; Annual Increases and Seasonal Variations 1972, 1973, 1974 and 1975 Models,* June 1976.

A-8 *Automobile Insurance Losses, Injury Coverages; A Preliminary Comparison of Results for Volkswagen Rabbits with Passive and Active Seat Belts, 1975 and 1976 Models,* June 1977.

A-9 *Automobile Insurance Losses, Collision Coverages; A Comparison of Collision Claim Size Distributions for 1974, 1975, and 1976 Models,* November 1977.

A-10 *Automobile Insurance Losses, Injury Coverages; Comparisons of Claim Frequencies of Volkswagen Rabbits with Automatic and Manual Seat Belts, 1975, 1976, and 1977 Models,* June 1979.

A-11 *Automobile Insurance Losses, Collision Coverages; The Consistency of the Loss Experience of Specific Vehicles Produced in Several Years, 1975 to 1978 Models,* June 1979.

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A-14 *Automobile Insurance Losses, Personal Injury Protection and Collision Coverages; Comparisons of the Loss Experience of Two- and Four-Door Cars, 1978, 1979, and 1980 Models,* June 1981.

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A-16 *Automobile Insurance Losses, Collision Coverages; The Frequency of Claims Involving Salvage; Subcompact and Compact Cars; 1980 Models,* January 1982.

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A-19 *Insurance Losses, Theft Coverages; A Comparison of the Theft Loss Experience of General Motors Passenger Cars With and Without Factory-Installed Theft Deterrent Systems; 1980-1981 Models,* January 1983.

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